Fate and Transport Approach Summary

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LWG Lower Willamette Group

Background

- EPA questions about modeling of chemical fate and transport processes
- Questions occur in a number of contexts:
  - Monitored Natural Recovery (MNR) evaluations
  - Food Web Modeling (FWM)
  - Hydrodynamic Modeling (HDM)
  - Groundwater Evaluations (GW)

Background and Purpose

- EPA concerned that eventual fate (and related risks) of chemicals will not be evaluated
- EPA suggesting that “robust” 3-D model needed
- LWG Tech Team concerns to robust model:
  - Impacts schedule to FS in 2007
  - History suggests will not be directly used in cleanup decisions
  - Expensive
- LWG Strategy Team – F & T Group Purpose
  - Make sure we have a comprehensive approach
  - Answer all of EPA’s stated questions
  - Explain that approach to EPA

Fate and Transport Processes

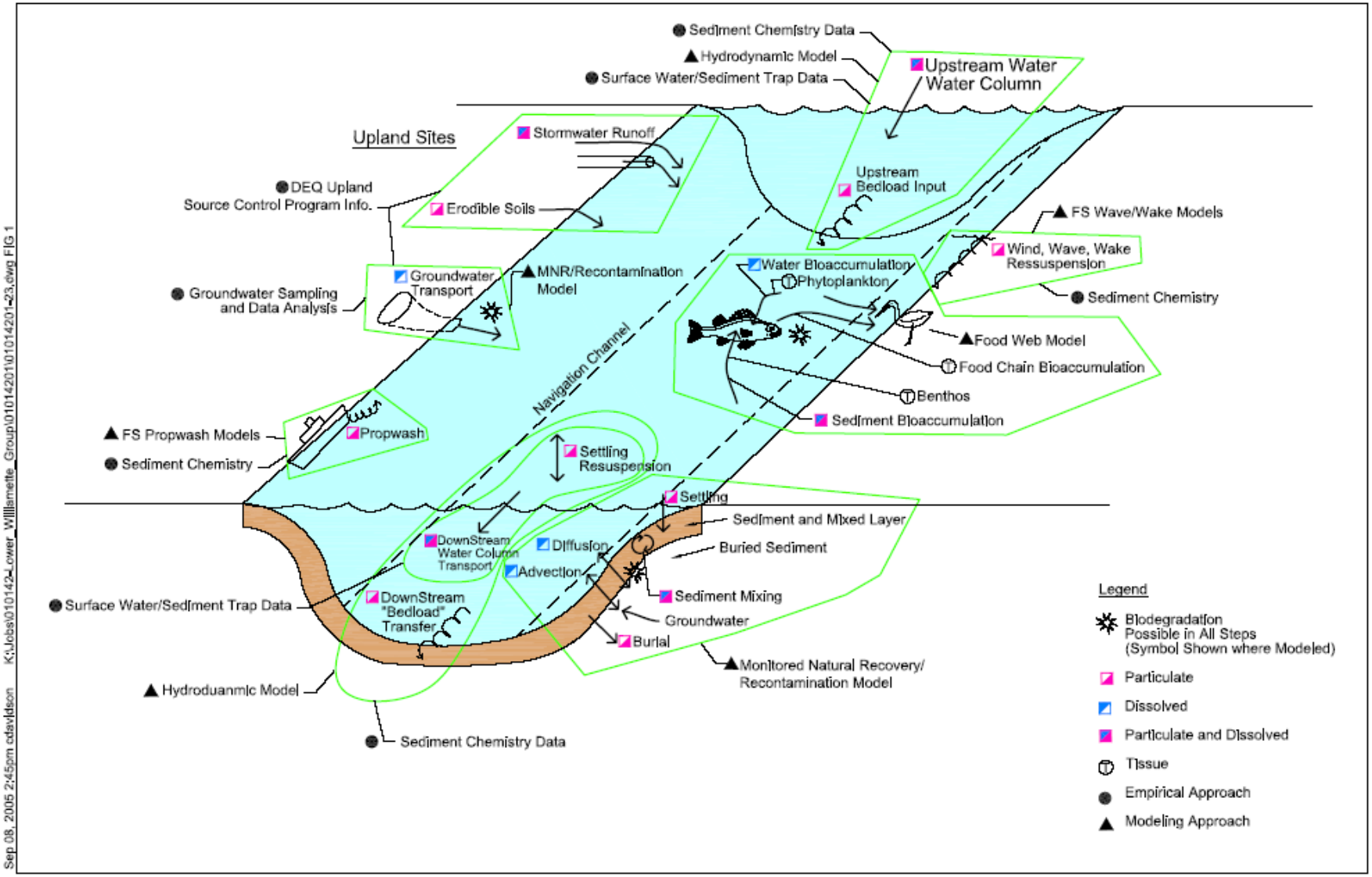

Figure 1
Fate and Transport Assessment Approach
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Determine EPA's F&T Questions

- Reviewed EPA comments on:
  - MNR approach
  - Hydrodynamic modeling
- Reviewed EPA discussions on:
  - Food Web Model
  - Groundwater approach
- Compiled into a list of all EPA stated issues
- Prioritized list based on our understanding of EPA's level of concern (subjective)
- Segregated questions that have a detailed process, documents, and/or group already addressing

Filter EPA's F&T Questions

- Prioritized list based on our understanding of EPA's level of concern (subjective)
- Segregated questions that have a detailed process, documents, and/or group already addressing this

Primary EPA F&T Questions

1. What are future risks due to erosion/ redistribution of sediments? (MNR and HDM)
2. What is the impact of various source control activities and remedial action alternatives on fish tissue concentrations? (FWM and MNR)
3. What is the potential for recontamination? (MNR)
4. What are acceptable sediment and water concentrations as back calculated from acceptable tissue concentrations? (FWM)
5. What are the effects of wind/wave/wake action and propwash on sediment erosion/redistribution? (MNR)

Questions Already Handled by Existing Processes and Groups

1. What are groundwater pathways and impacts to river media including sediments, surface water, and tissue? (GW)
2. What is the potential for MNR via primarily depositional processes? (MNR)
3. What is the ranking of risks from various sites and/or chemicals to human and ecological receptors? (FWM)
4. What are benthic invertebrate and fish tissue chemical concentrations in species or at locations where little data exists? (Risk Assessment)

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Other Questions

1. Are sediments posing risk leaving the site? [Corollary to first question regarding risks caused by redistribution of sediments] (MNR)

- Several lines of evidence:
  - Downstream areas have relatively low conc.
  - Cleaning up Study Area will drive them lower
  - General info. indicates this is a dispersive process – downstream conc. always lower than upstream

Approach for High Priority Questions

- Review existing tools, their limitations, and interactions
- Summarize approach based on existing tools
- Identify data needs for approach
- Summarized in table matrix

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1. What are future risks due to erosion/ redistribution of sediments? (MNR and HDM)

- Erosion - Use propwash, wave/wake, hydrodynamic model outputs, and sediment core data to define upstream erosion.
- Deposition - This information feeds into simple conservative downstream deposition assumptions facilitated by MNR model and sediment trap data.

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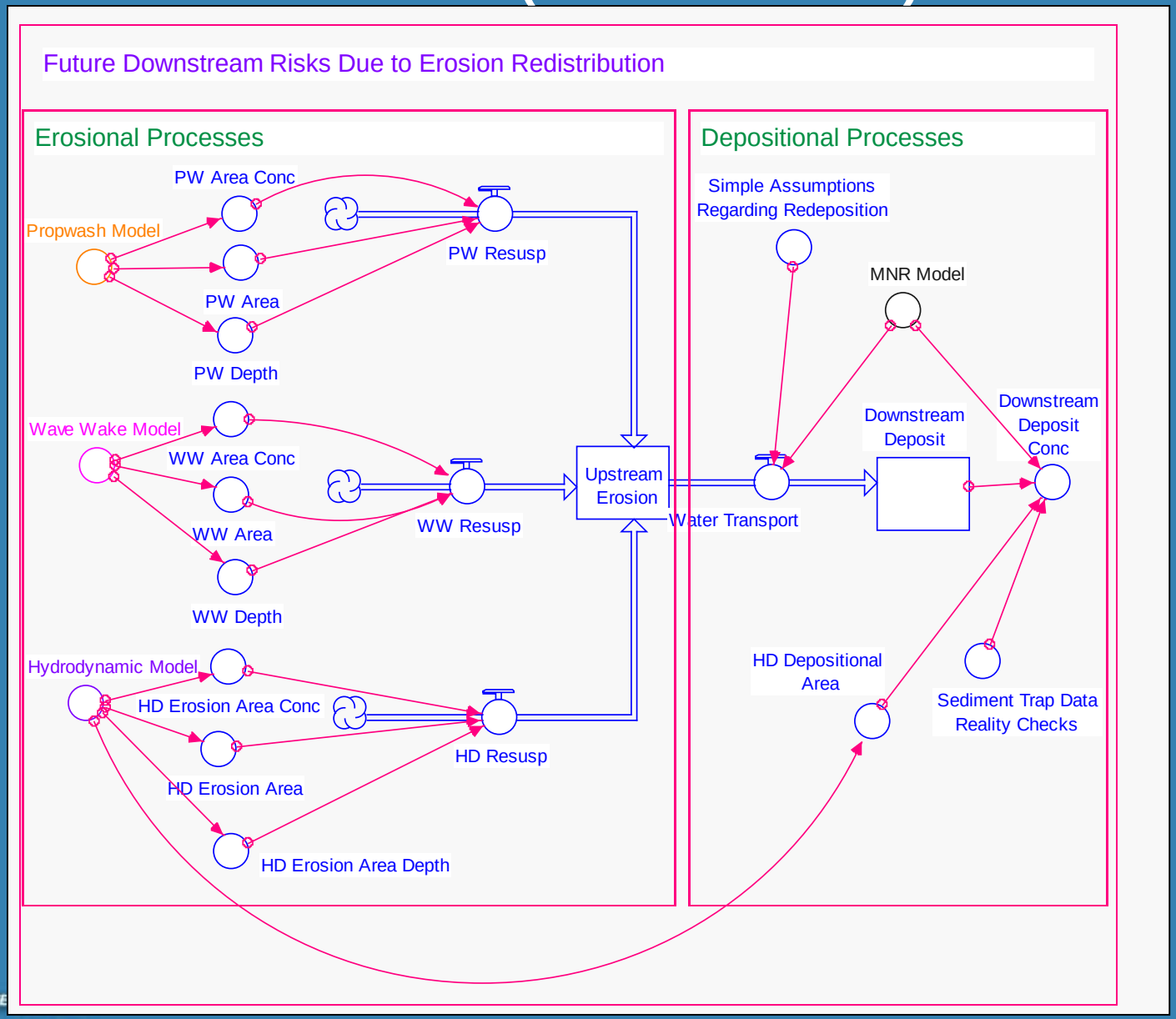
1. What are future risks due to erosion/ redistribution of sediments? (MNR and HDM)



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2. What is the impact of various source control activities and remedial action alternatives on fish tissue concentrations? (FWM and MNR)

- Erosional - use hydrodynamic, propwash, and wave/wake models to predict conc.
- Remediation Areas - use background concentrations.
- MNR Areas – use MNR model (sed. trap, core data)
- Calculate overall site-wide sediment conc. from above.
- Estimate surface water reductions from percent of controlled flows based on DEQ information.
- Use a range of assumptions if DEQ info not available.
- Enter sed./water conc. into Food Web Model - future steady state concentrations.
- Use decay constant for time to reach predicted tissue conc. (does not use FWM).

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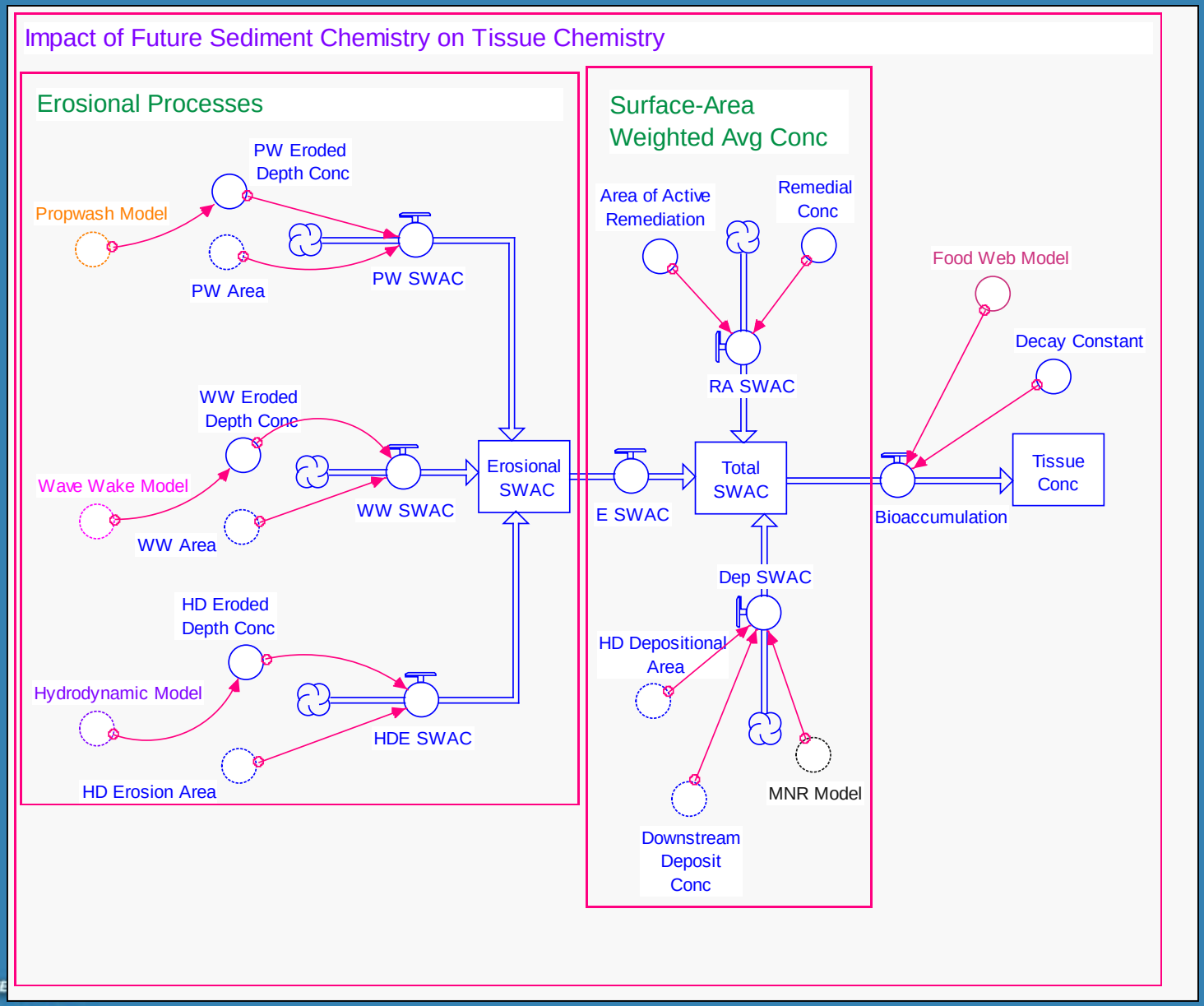
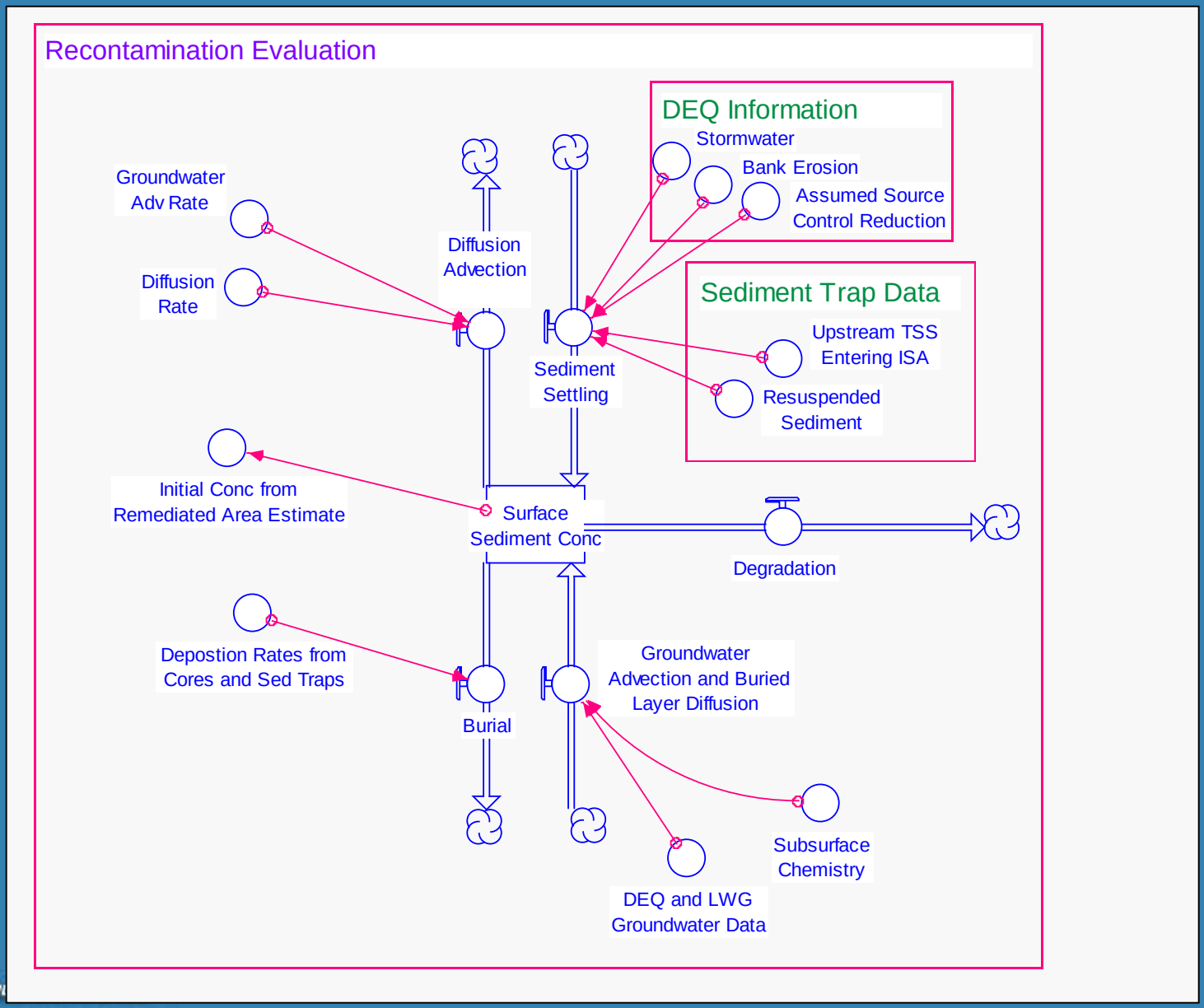


3. What is the potential for recontamination? (MNR)

- Determine erosional and depositional areas from hydrodynamic model.
- Depositional - estimate initial “clean” conc. in remedial areas and extrapolate to future using MNR model, sediment trap, and groundwater data.
- Erosional/Dynamic - Use new "clean" surface (e.g., dredged or capped) as the chemical concentration. Assess groundwater inputs based on DEQ and LWG generated groundwater data and MNR model.
- Source Controls - Estimate future source control by based on DEQ information regarding percent of flows to be controlled. If not available, use simple range of reduction assumptions.

3. What is the potential for recontamination? (MNR)



4. What are acceptable sediment and water concentrations as back calculated from acceptable tissue concentrations? (FWM)

- Use Food Web Model to directly calculate through iterative approach
- Determine sediment and water concentrations that lead to tissue concentrations associated with specific risk estimates.
- Conduct distributional/statistical analysis of sediment data outside model
  - Determine if hot spot removal scenarios, would achieve necessary overall sediment concentration goals.

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5. What are the effects of wind/wave/wake action and propwash on sediment erosion/redistribution? (MNR)

- Use readily available propwash models and wind/wake calculations
- Use grain size, river use, and water depth info. to understand and map areas that may be susceptible to erosion of this type.
- Determine reasonable maximum depth of erosion.
- Examine sediment core data to determine expected conc. of sediments at erosion depth.
- Compare these concentrations to risk based goals to determine potential future risks.

Data Needs

- Summarized in matrix – in process
- Mostly available from already planned efforts and/or existing information
- New data requirements are relatively minimal (although not zero)

Path Forward

- Present our approach to EPA (this presentation)
- Obtain feedback
- Discuss with EPA questions regarding robust 3-D model
  - Schedule implications?
  - Does it really raise certainty? (black box effect)
  - Is it really used in the ROD? (point to other sites)
- Map out EPA agreed approach and implement.